

EPA Efforts: Carbon Capture and Storage

International Symposium on Site Characterization

Lawrence Berkeley Lab, California

March 20-22, 2006

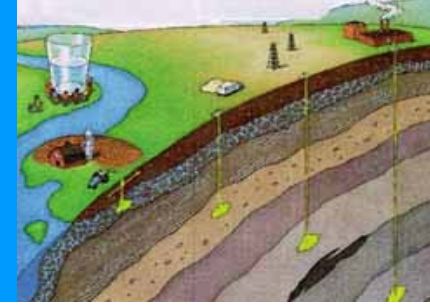
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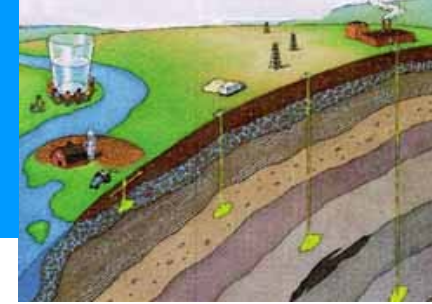
Overview



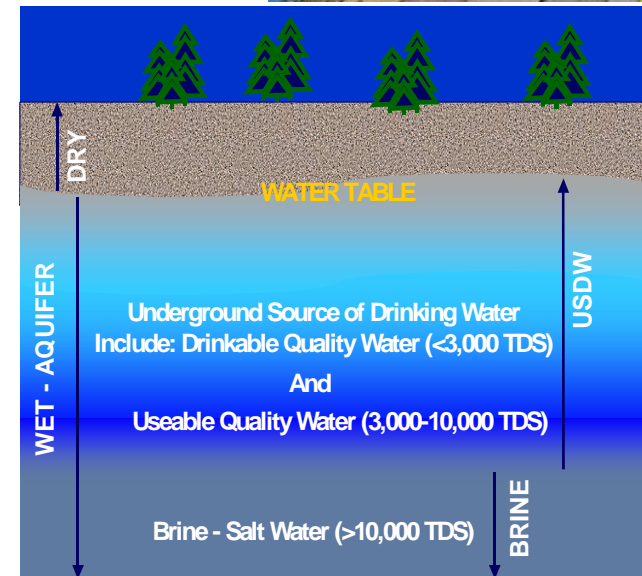
- Background and principles of EPA's Underground Injection Control Program
- EPA participation at third party conferences and development of its own initiatives, including a Geologic Sequestration Workgroup
- Potential gaps in research, practical questions, and timing considerations to facilitate potential EPA regulatory actions or guidance for permitting wells

UIC Program

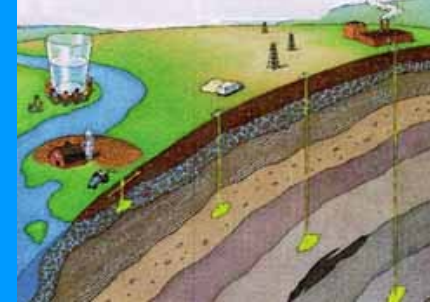
General Overview



- SDWA requires EPA to develop minimum federal regulations for state and tribal Underground Injection Control (UIC) Programs to *protect underground sources of drinking water*
- USDW are defined as aquifers or portions of aquifers that:
 - have sufficient quantity of ground water to supply a public water system and
 - contain fewer than 10,000 mg/l or ppm total dissolved solids
- 33 states have primary enforcement authority (primacy); EPA directly implements the program in 10 states; 7 split programs
- Primacy States can be more stringent than the minimum federal regulations
- KEY CONCEPT: SDWA provides EPA and States with flexibility to establish effective Class II oil and gas programs (Section 1425)



UIC Program: *More Key Concepts*



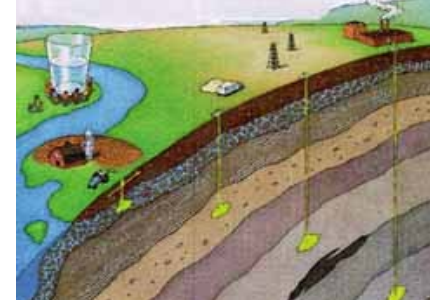
- **Safe Drinking Water Act (SDWA)**
 - UIC Program regulates underground injection of ALL fluids – liquid, gas, or slurry
 - Program covers injection of wastes and commodities (e.g. liquid hydrocarbons, water)
 - Only federal exemptions for natural gas storage and specific hydraulic fracturing
 - Therefore, EPA believes that the UIC program provides existing framework for CCS technologies

UIC WELL CLASSES

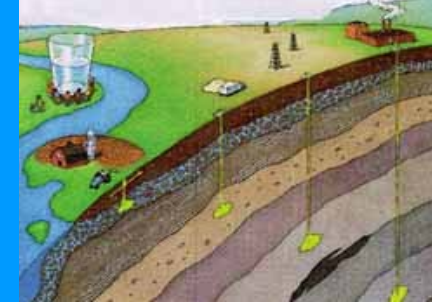
Class I Class II Class III



Class V



Regulatory Framework

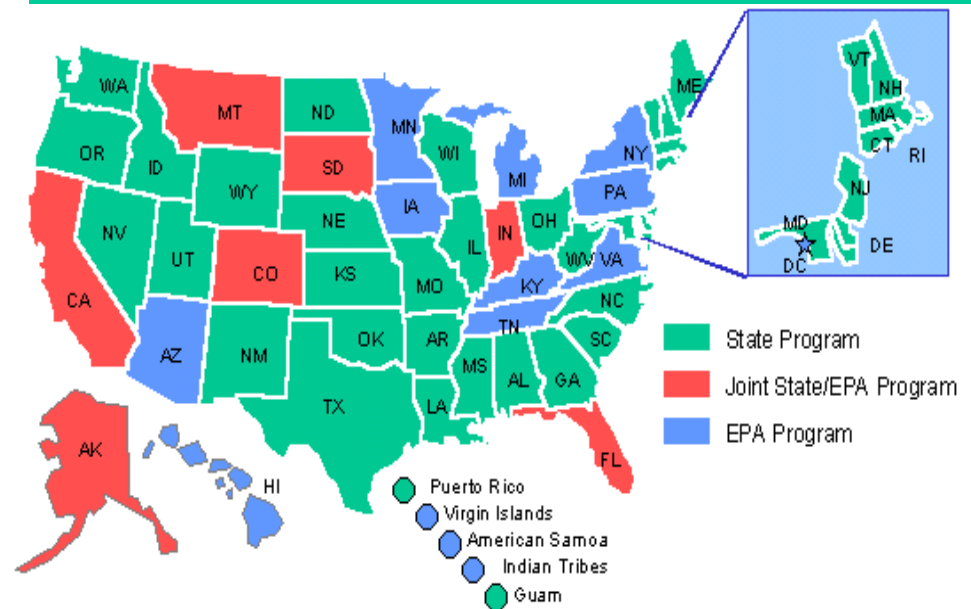


“With appropriate site selection..., a monitoring program..., a regulatory system, and the appropriate use of remediation methods..., the local health, safety and environmental risks of geological storage would be comparable to risks of current activities...”

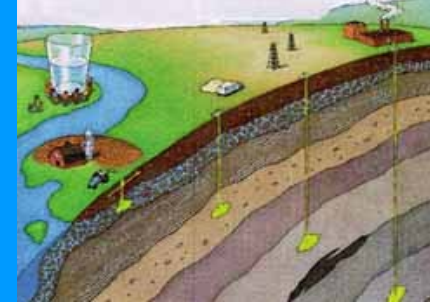
-Summary for Policymakers, IPCC Special Report on CCS



Underground Injection Control (UIC) Program



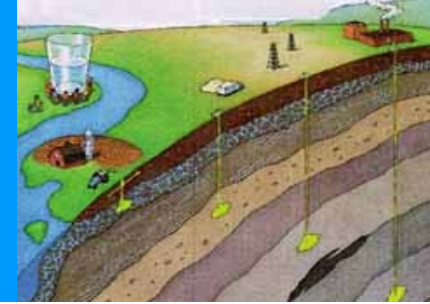
Cooperative Efforts



EPA has been active in various forums:

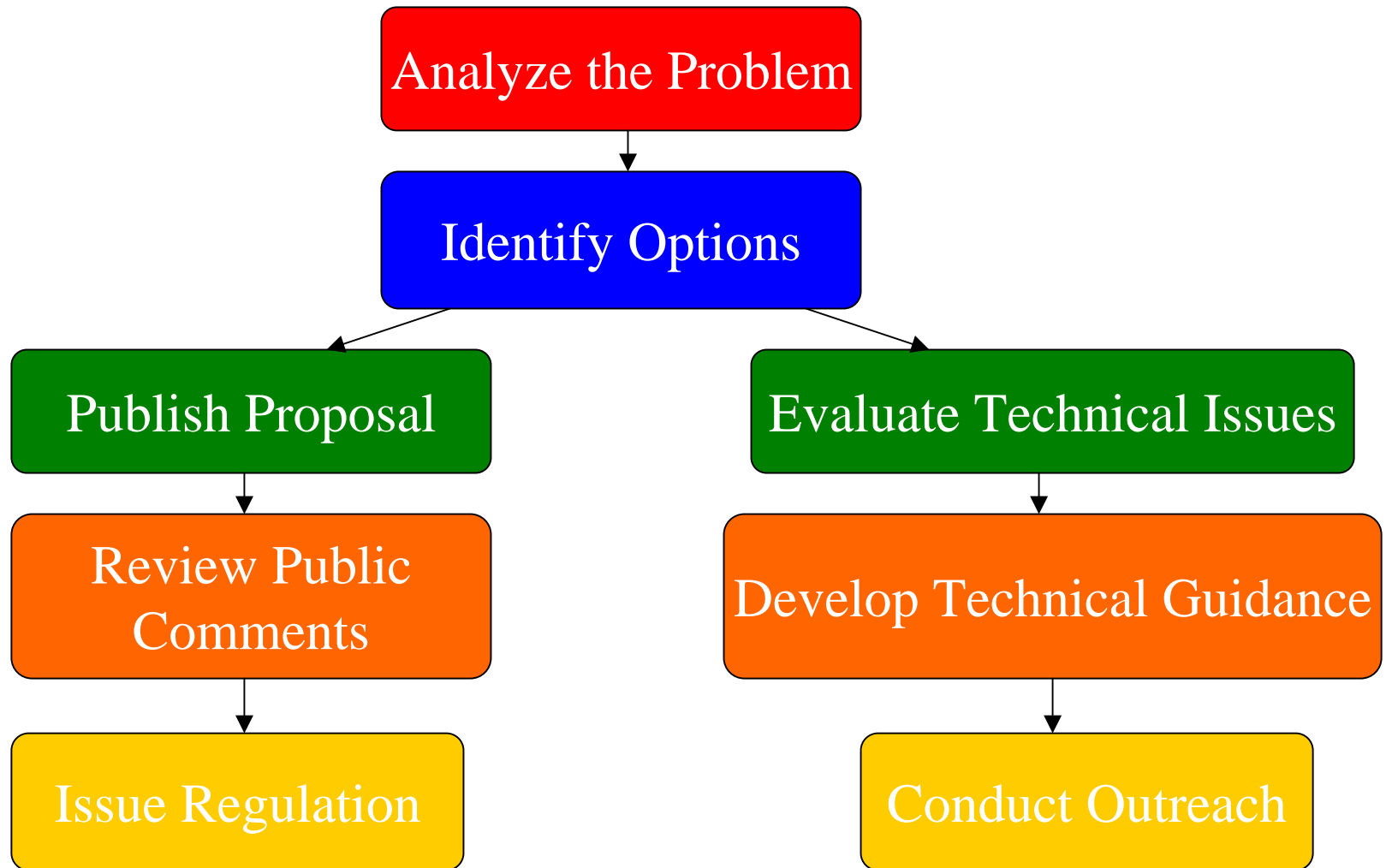
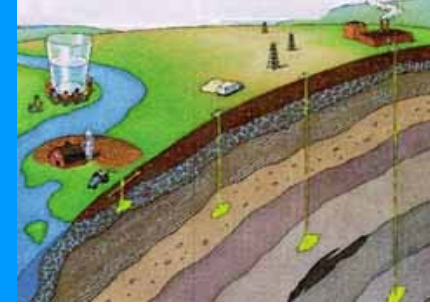
- International Efforts
 - Carbon Sequestration Leadership Forum (CSLF)
 - Intergovernmental Panel on Climate Change (IPCC)
 - London Convention and London Protocol
- Federal Efforts
 - Working with DOE Labs (NETL, LBNL)
 - GHG Inventory and Accounting
 - Conferences and Workshops
- State Efforts
 - EPA Regional/State Meetings
 - Ground Water Protection Council (GWPC)

EPA Efforts: Geologic Sequestration Workgroup

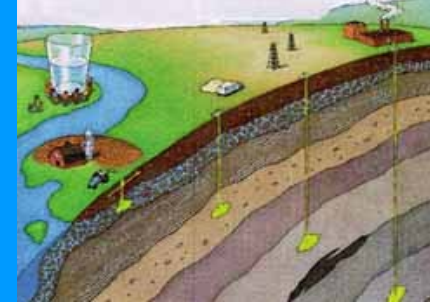


- Collaborative efforts on CCS started by EPA Office of Air and Radiation (OAR) and Office of Water in early 2004
- Internal EPA Geologic Sequestration Workgroup formed including 30 members from HQ Offices, EPA Regions and Labs (August 2004)
- Initial focus on technical and regulatory issues, risk assessment, communication and outreach

Role of an EPA Workgroup

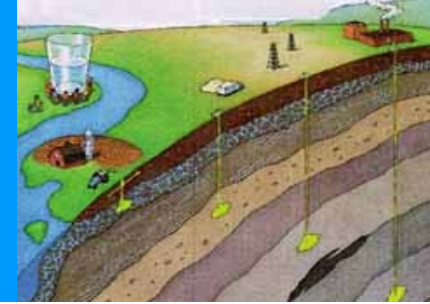


EPA Regulatory Development Goals



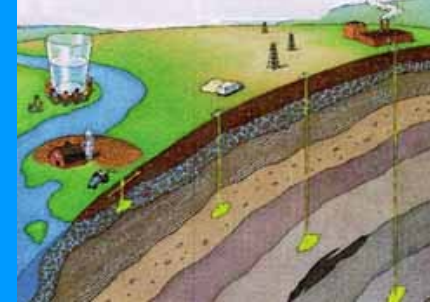
- Protect human health and the environment
- Ensure that decisions are cost-effective and fully protective
- Conduct high quality scientific, economic, and policy analyses at early stages so that decision makers are well informed
- Apply new and improved methods to protect the environment
 - build flexibility into regulations from the very beginning
 - create strong partnerships with the regulated community vigorously engaging in public outreach and involvement
 - use effective non-regulatory approaches

Key Technical Issues



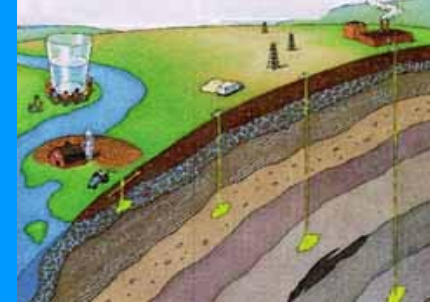
- Site characterization for CO₂ injection well projects including geology, geochemistry, and geohydrology
- “Area of Review” to determine locations of abandoned wells or other conduits for leakage
- Well construction and plugging and abandonment procedures for well closure
- Predicting fate of CO₂ (modeling and analytical tools)
- Monitoring and verification

EPA Efforts: Technical Workshops



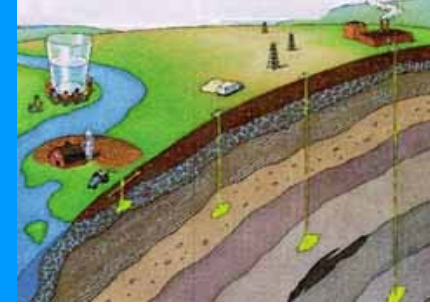
- Geologic Modeling and Reservoir Simulation
 - April 6-7, 2005 in Houston, TX
 - Assess modeling capabilities for site characterization, risk assessment, and simulating long-term storage
- IPCC Inventory Guidelines & US GHG Inventory Methods
 - March 9, 2005 in Washington, DC (IPCC Guidelines)
 - September 27, 2005 in Portland, OR (EOR/US Inventory)
 - Encourage active participation and expert input in development of IPCC Guidelines and improving US Inventory
- Risk Assessment & Management
 - September 28-29, 2005 in Portland, OR
 - Share information and solicit expert input from a wide range of stakeholders including researchers, industry, NGOs, and regulators.

EPA Workshop Findings



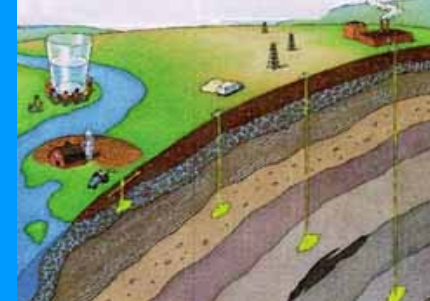
- Strong participation in our workshops, and good suggestions for further research
- Areas include additional risk assessment and site characterization for permitting
- This symposium will further inform EPA's efforts related to well siting
- There are several other “gaps” EPA may explore including modeling of CO₂ behavior in the subsurface, leakage scenarios, and potential health effects from large scale CO₂ release

EPA Future Regulatory Role



- All regulatory agencies have an important role to play in building public confidence that CCS can be implemented safely and effectively
- But as the findings from the workshops indicate some uncertainties with respect to the potential risks of CCS and monitoring technologies still may exist
- *However*, we have a regulatory framework and years of technical experience with underground injection
- Our goal is to utilize that expertise, focus on near-term implementation issues, and collaborate with DOE, states, industry, and academia to ensure success

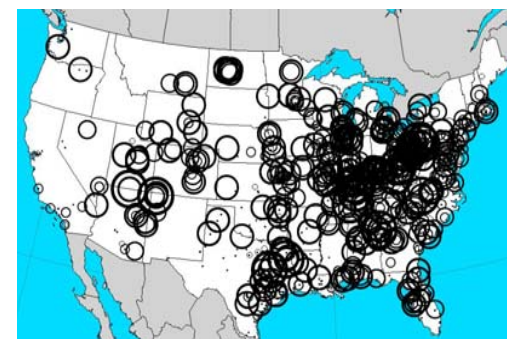
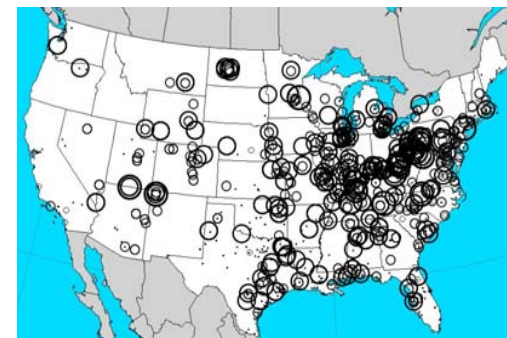
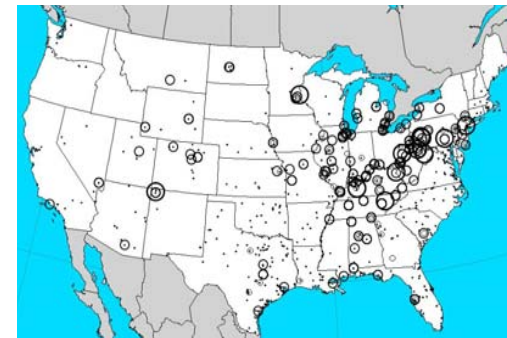
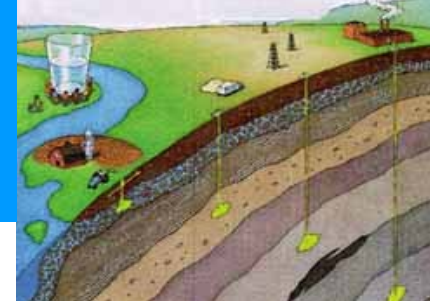
Regulatory Next Steps



- Building on Frio, Mountaineer, and other R&D project experience, EPA will pursue development of a Class V experimental technology guidance for CO2 injection
- This will be fleshed out by the GS WG, sent to EPA management, and then to DOE and the states for comments before being finalized sometime in 2006
- Although this will address the short-term DOE CCS pilot projects, EPA will still need information acquired from these pilots to inform any regulatory approach for the long-term commercial projects anticipated by 2012

Scope of CCS UIC Program

- The potential deployment of CCS technologies could be massive and the potential implementation of CCS in the US could entail:
 - 1,000s of power plants and industrial facilities capturing CO₂, 24-7-365.
 - 100s to 1000s of communities living nearby CO₂ capture and/or storage facilities.
 - 10,000s of injection wells.
 - 1,000s of miles of dedicated CO₂ pipelines.
 - 100s of millions of tons of CO₂ being injected into the subsurface annually.
- Policies to allow the US to “grow its way out” of the nation’s CO₂ emissions are likely inconsistent with stabilization at lower levels.
- The nation will therefore need a broad and robust portfolio of carbon management options as there truly is no “silver bullet”(injection wells).



EPA's Reason to Stay Involved:

Protect Public Health

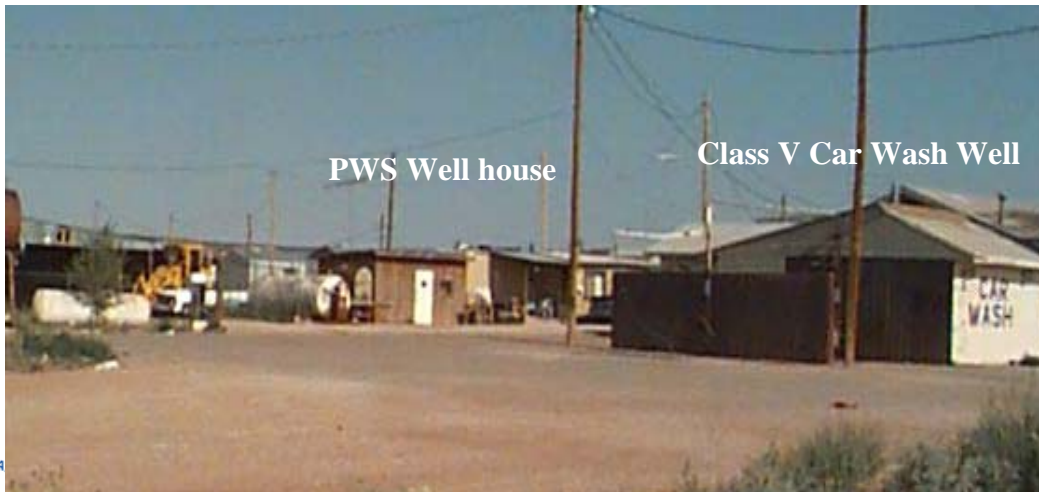
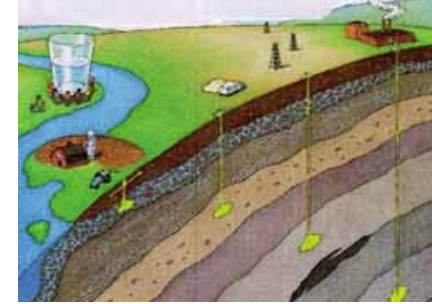
- Nature of some injected fluids may pose a risk to ground water quality and public health if managed improperly.
- Deep **Class I** and **Class II** wells must be properly sited, operated and constructed to avoid contaminating USDWs.

Class V Wells:

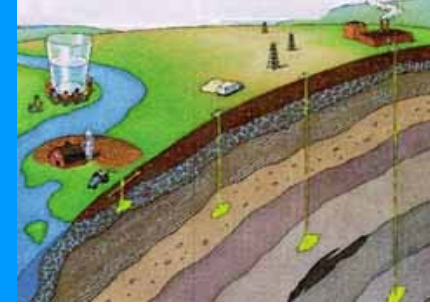
Are numerous & may be in close proximity to PWS or private wells;

Inject a wide range of fluids;

Inventory, location & injectate data is incomplete.

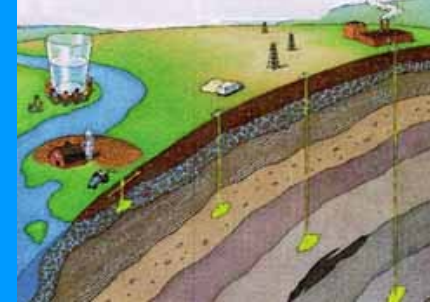


Summary



- U.S. is uniquely positioned to support global efforts to facilitate deployment of CCS
 - DOE R&D and Regional Sequestration Programs continue to provide data through demonstration projects
 - EPA's UIC program provides an existing framework and demonstrates safe underground injection of a variety of fluids
- EPA is currently evaluating technical and regulatory issues along with accounting approaches for national inventories
- EPA has identified practical questions with respect to site characterization and monitoring, and is evaluating the need, timing, and data requirements for regulatory development

Final Thoughts



- EPA shares your enthusiasm for CCS technologies which could address harmful climate change
- All Groups – the international community, states, industry, academics - can provide positive contributions to CCS efforts
- Participation by, and outreach to the public, in all arenas, will be *critical* to the success of CCS
- USEPA will continue to be an active participant